MEDICAL SCIENCES

COVID-19 ASSOCIATED WITH DIABETES MELLITUS: CHARACTERISTICS OF THE COURSE OF THE DISEASE

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Annotation: We analyzed a number of articles relating to COVID-19 and diabetes. Further below is a summarized information about severity of the condition of COVID patients with concomitant diabetes.

Key words: COVID-19; Diabetes mellitus; Comorbidity; Disease severity; Mortality; Cytokine level.

Coronavirus disease 2019, caused by COVID-19 became a global pandemic and has spread all over the world. Nowadays it has become a worldwide health concern. Currently, the number of cases is drastically increasing. Globally, by September 29, 2022, there have been 613 942 561 confirmed cases of COVID-19, 6 520 263 deaths including, reported to the World Health Organization [1].

According to recent meta-analyses, patients with diabetes mellitus are at risk of developing symptomatic SARS-CoV-2 infection and COVID-19-related hospitalization, ICU admission rate, renal replacement therapy, cardiac diseases, thromboembolic events and lethal outcome.

Patients with pre-existing endocrinologic diseases may be predisposed to more severe presentations of COVID-19, observations of a range of endocrinologic manifestations in patients without pre-existing disease have also been made.

There are a variety of mechanisms that may influence the course of a disease, make it more severe, including aggravation of hyperglycemia and ketosis, which can be seen in patients with COVID-19 and concomitant diabetes. SARS-CoV-2 substantially elevates cytokine levels, which leads to defects in pancreatic β-cell function and apoptosis which leads to decrease of insulin production and subsequent ketosis [2]. In addition to factors listed above, accelerated fat breakdown in patients with COVID-19 might also be one of the possible mechanisms. The patient's condition is also affected by factors not specific to COVID-19; these factors include an altered immune response and an increased level of counter-regulatory hormones which increases hepatic glucose production, decreases insulin secretion, ketogenesis, and insulin resistance.

Ketoacidosis is a serious metabolic disorder caused by the accumulation of ketone bodies and acidification of blood. This condition is mostly seen in patients with diabetes, but can be observed in patients with other pathological conditions. Diabetic ketoacidosis may cause lethal outcome if not treated correctly. Such a condition is caused by uncontrolled blood glucose levels, and this is more common in people with the first type of diabetes. Nevertheless, it can also occur in patients with viral infections and type 2 diabetes [3].

According to the results of recent studies, patients with confirmed COVID-19 infection who previously were diagnosed with diabetes mellitus, were found to be at higher statistically significant risk of a more severe course of coronavirus infection. Increased odds of mortality was reported in COVID-19 patients who were previously diagnosed with diabetes mellitus. The studies did not reveal any correlation between gender and severity of a COVID disease among diabetic patients as well as mortality rate compared to non-diabetic patients.

There are several explanations of mechanisms that lead to higher risk of a severe course of the coronavirus disease. Patients with diabetes are known to have

comorbidity conditions such as cardiovascular and renal damage, that impact the course of COVID-19 infection. Moreover, the key mechanisms of multi-organ damage that is secondary to COVID-19 infection are the following: direct viral toxicity, endothelial cell damage and thrombosis, defection of the immune response, and dysfunction of the renin–angiotensin–aldosterone system (RAAS).

The level of cytokines like interleukin-6 (IL-6) that are released due to coronavirus infection were discovered to be higher in COVID patients with diagnosed diabetes [4]. Thus we can consider the presence of an underlying pro-inflammatory cause as one of the mechanisms connecting COVID infection to more severe outcomes in diabetic patients. It is worth mentioning that patients with diabetes suffer more frequently from obesity, which can impact the prognosis of disease.

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